Parasitology in California

A Changing Picture Owing to Changes in Population and Environment

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■ *The changing population in California produced by increased migration from other parts of the country and immigration from foreign countries, and by increased foreign travel, has altered the incidence of parasitic infections.*

Variations in the environment due to increased areas of land under irrigation, urbanization, industrialization, variations in the numbers of animals and insects and changing dietary habits have also effected changes.

With the great influx of persons into our state, physicians should be continually aware of the influx of parasites along with them. These parasites may produce disease in the individuals, may cause small outbreaks or epidemics where environmental conditions foster the propagation of these parasites.

CALIFORNIA'S rapidly growing population has brought with it an increasing incidence of parasites and diseases which were either non-existent or extremely rare in the past, and Californians who go abroad may return with some of these unusual diseases. California is the center for many international corporations whose employees are exposed to tropical and parasitic diseases. This group may return with such unusual conditions as filariasis, schistosomiasis, amebiasis, malaria and many others. Since travelers from abroad or immigrants are becoming more numerous and more and more Californians are visiting foreign lands, it is timely to draw attention to the rising incidence of these bizarre disorders.

Travel and immigration are not the only factors which are changing the picture of parasite infestation in humans. Great changes are taking place in the environment itself, so that disease processes previously absent may now become endemic. The ever-increasing use of irrigation raises the humidity and produces constantly moist earth so that hookworm infestation and strongyloidosis may become en-

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demic. Since the snails that carry the organisms are present in our rice fields and other irrigation projects, we face the possibility of an endemic focus of schistosomiasis. So far as human schistosomiasis is concerned, no known endemic area exists in the state, but certainly bird schistosomiasis is on the increase with the resulting increase in "swimmer's itch"[5] in human subjects. Undoubtedly many cases of unexplained eosinophilia are due to this cause.

Another factor in the changing picture of disease is our eating habits. The advent of frozen dinners and other precooked foods has increased the incidence of enteric infections, and the eating of rare or raw beef has caused an upturn in the incidence of tapeworm infection.

Not only are we experiencing changes in human population, the kinds and numbers of animals also are changing. As to wild animal life this is particularly noticeable among birds—the increase in numbers of pigeons and the appearance of starlings. It has been pointed out that cryptococcus infections are carried by pigeons, and the ubiquitous starling, along with bats and other flying creatures, carry histoplasmosis.

Pets and infections due to pets are on the increase. The disease known as visceral larva migrans occurs when persons, mostly children, contract animal roundworm infections. The dog and cat ascaris *(Toxocara canis* et *T. Cati)* is the most frequent source of this disorder. The eggs of these parasites are deposited in a garden or sand box where they mature and infect children eating dirt or food contaminated with dirt. The larvae of these worms migrate through the tissues and become "lost." As a rule they do not pass through the normal channels to the lung and back to the bowel, but may migrate into almost any organ, including the eye, where they may cause blindness.[1] Dipylidiasis is a disease that is caused by dog tapeworm *(Dipylidium caninum)* infection of humans. Recently we reported two such cases.[9] This worm's life cycle requires the flea as an intermediate host. The flea ingests the tapeworm egg and after the larva of the worm passes through its cycle in the flea, the dog becomes infected by eating the flea. It is thought that children who kiss dogs or are frequently licked about the face and hands by dogs may acquire the infection by the deposition of fleas or parts of flea onto the child by the dog's saliva.

Changes in the industrial picture are producing a change in disease patterns, but so far as is known this has not greatly affected parasitic infections other than in occupations necessitating travel in and out of this country, such as farm labor by Mexicans who annually bring a few cases of malaria, tapeworm, ascaris and other parasitic infections across the border. These are certainly not in epidemic proportions but are of great interest to parasitologists and epidemiologists. Migratory labor camps are potentially foci of disease which may spread into the neighboring community.

Data on studies of stools recorded in the Tropical Diseases Laboratory at the University of California Medical Center in San Francisco based on over 2,000 examinations yearly do not indicate any specific trend in morbidity because of the relative rarity of parasitic infection, but more species of parasites have been noted in recent years than ten years ago. Of course, stools sent to the Tropical Diseases Laboratory are from a selected group of persons, many of whom are suspected of having disease. Others are being screened because of recent work or travel in the tropics. The incidence of disease in this group does not reflect an accurate picture in the general population. It is my clinical impression, from patients seen, that there is a general although still very small increase in the incidence of parasitic disease. Since only malaria and amebiasis are reportable, no statistics are available in other parasitic infections. It is the principal point of this paper to stress the importance of the appearance of these relatively rare conditions so that they will be more promptly recognized and treated.

Routine examination of the stools of food handlers at the University of California Medical Center were carried out in 1961 and 1962. Twenty-four of 216 examined in 1961 and 22 of 247 examined in 1962 had stools that were positive for potentially pathogenic organisms. Only two cases of *E. histolytica* were noted, both in 1962. This group of 463 food handlers probably had a higher incidence of parasitic disease than the general population due to a high proportion of Filipinos, many of whom had recently immigrated.

Many of the specimens on which the report was positive were not associated with illness. The organism of highest incidence was *E. coli,* which was seen in 16 cases. *E. nana* and Trichuris were observed in 14 cases each, hookworm in three, strongyloides in two, and tapeworm, Ascaris, Giardia, Trichomonas and *I. bütschlii* in one case each. There were no recorded cases of pinworm, which should be relatively high, but had peri-anal swabs been examined it is probable that pinworm would have been found in many cases. Pinworm eggs are not often found in the stool. Peri-anal scotch tape pads are essential for accurate diagnosis of this condition.[4]

Amebiasis

Amebiasis, in general, would appear to be decreasing. However, in state institutions, particularly mental institutions housing the mentally deficient, the incidence is still high. In 1933 Johnstone[6] made extensive studies and from data on 1,000 prisoners at San Quentin he estimated the incidence of amebiasis in

the general population of California at about 8 or 10 per cent. Adequate data for determining the incidence in the general population are not available, but from meager statistics and the overall findings in the stool examinations done in the Tropical Diseases Laboratory, it appears that the incidence of *E. histolytica* in the San Francisco Bay area is in the neighborhood of 1 per cent. To be conservative, we have indicated that the incidence of *E. histolytica* in the general population of California is certainly less than 3 per cent, probably in the neighborhood of 1 per cent or less. This incidence includes all cases, whether symptomatic or asymptomatic. It is supported by Brown's[2] study in 1960 of military personnel at four bases in California.

It is well to remember the incidence of amebiasis is directly proportional to the degree of fecal contamination of the food. This is also true of the incidence of viral hepatitis. Hence in dealing with outbreaks of viral hepatitis the stool should be carefully examined for amebic infection as well, and it should be borne in mind that communities about state hospitals are likely to have a higher incidence of amebiasis than others. Amebiasis in most cases is asymptomatic, or the symptoms are so mild that the person affected may not seek medical attention. For that reason, routine stool studies should be done on persons from these highly endemic areas to pick up "carriers."

Malaria

California is a keg of powder when it comes to malaria. There are numerous anopheline mosquitoes in the Central Valley and if a sufficient number became infected an epidemic of human cases could occur. Fortunately, with modern treatment the disease could be controlled in the individual cases and the foci of infestation in the community could be wiped out. But it is well for us to be alert.

An excellent example of a small epidemic of malaria in California is the group of cases reported in 1954 when a Korean veteran had a relapse of *vivax* malaria while camped for only three days near a girls' summer camp.[3] It is surmised that this one individual must have infected many mosquitoes, which in turn infected 34 campers. The fact that such an outbreak could be brought about from one infected person in so short a time emphasizes the importance of continual vigilance, prompt treatment and isolation.

Schistosomiasis

Schistosomiasis to most of us is a disease which exists well over the horizon, and is never expected to occur in California. However, during the past year I have seen three cases, all in farm laborers, two of whom were from Puerto Rico and one from Egypt. Obviously these persons did not acquire the disease in California. However, the detection of their disease was difficult, and probably there are many more such cases which are not detected. With improper sanitary habits it is possible that in the future we will find schistosomiasis in some person who has never left California.

Most[7] reported four cases of schistosomiasis in travelers returning from abroad. They had become infected while in Egypt on "economy tours." They bathed in hotels that used water from rivers or irrigation ditches to fill their bathtubs. Since the most important phase of parasitology is prevention, we must practice good prevention by warning our patients to avoid swimming or bathing, even if it is in hotels, in water that has not been properly treated.

Tapeworm

Most of the cases of tapeworm infestation we see in California are acquired abroad. I have treated a business man who apparently became infected in the South Pacific, a stockbroker from Europe, two doctors' children from France, a teacher from France and a defense worker from Algeria. However, I recently saw two cases of *Taenia saginata,* apparently acquired by eating rare hamburgers at a hamburger stand in Palo Alto. Our modern sewage disposal systems do not destroy *Taenia* eggs. Therefore, cattle grazing in the lush pastures surrounding sewage disposal plants may acquire *Cysticerosis bovis,* and if their tissues are eaten rare or raw we must expect to find some tapeworms.

Hookworm and Strongyloidosis

Seventy-five years ago we had an endemic area of hookworms here in California—in the gold mining region about Grass Valley. Why? The answer is simple. The only place hookworm was endemic in England was in the tin mines of Cornwall where the moist warm earth beneath the ground is ideal for the development of the larva. Miners frequently defecated in the mine tunnels. When our gold mines in the Grass Valley area were recruiting miners, many migrated from Cornwall and brought hookworm with them. Changes in the economy and in sanitation have wiped out the endemic foci.

In April 1962 a 12-year-old boy was admitted to the University of California Hospital with a diagnosis of probable eosinophilic leukemia. He had a leukocyte count of 17,000 per cu mm with 36 per cent eosinophils. Stool examinations were made and a massive infection of Strongyloides was discovered. Once this infection was cured the blood cell count returned to a normal range and general debility cleared. Near Tracy where this boy lived we

took a number of earth samples around irrigation ditches close to his home but were unable to demonstrate a focus of infection. Neither other members of his family nor his dog were infected. We have dealt with two other cases of Strongyloides infection from the same general area but have been unable to locate an endemic focus. As I have pointed out, increased areas of irrigation have produced areas of continuous moisture where almost desert aridity existed before. Certainly in some of these areas endemic hookworm or strongyloides may develop unless proper hygienic and public health measures are followed.

Ascaris

Ascaris is still a rare condition in California, but infected persons from out of state occasionally come to attention here. I recently observed two unusual cases.

One was that of a young Filipina who died suddenly in the recovery room following the delivery of a child. At autopsy a male ascaris was found to have migrated into the glottis, closing the airways and causing anoxia. Undoubtedly the infection had occurred in the Philippines. At autopsy it was the only worm found, and since it was a male it was impossible to detect by stool examination.

The second case was that of a young woman from Central America with peculiar "functional" gastrointestinal complaints. Roentgenograms demonstrated three worms in the bowel. As stool examinations were negative for ova, it was assumed all the worms were male. Two of the worms, both male, were recovered; the third worm was not recovered. Subsequent x-ray studies showed no evidence of worm.

Filariasis

Filariasis is another rare condition sometimes seen in California. Many of the members of the armed services serving in the South Pacific during World War II became infected. These infections are now probably all "burned out," but we do occasionally see an individual with filariasis recently acquired in the tropics.

Onchocercosis is common in Guatemala and other Central American areas. Patients from these areas should be examined carefully for nodules about the scalp, face and neck.

In 1956[8] I observed a case of loaisis in the daughter of a missionary from Central Africa, and in 1959 a second case, this time in a mining engineer who had been prospecting for diamonds in Central Africa. In both cases there was good response to Hetarazan therapy.

In conclusion, I would like to emphasize that changing population and changing travel habits are bringing increasing numbers of parasitic infections into California. Physicians should be aware of this in order to advise patients on means of preventing parasitic infections while abroad, and they should attempt to detect parasitic infections early in order to adequately treat and to prevent development of endemic foci.

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